

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE
MATHEMATICS **0580/4, 0581/4**
PAPER 4
MAY/JUNE SESSION 2001 2 hours 30 minutes

Additional materials:

Answer paper
Electronic calculator
Geometrical instruments
Graph paper (2 sheets)
Mathematical tables (optional)
Tracing paper (optional)

TIME 2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces provided on the answer paper/answer booklet.

Answer **all** questions.

Write your answers and working on the separate answer paper provided.

All working must be clearly shown. It should be done on the same sheet as the rest of the answer. Marks will be given for working which shows that you know how to solve the problem even if you get the answer wrong.

If you use more than one sheet of paper, fasten the sheets together.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [] at the end of each question or part question.

The total of the marks for this paper is 130.

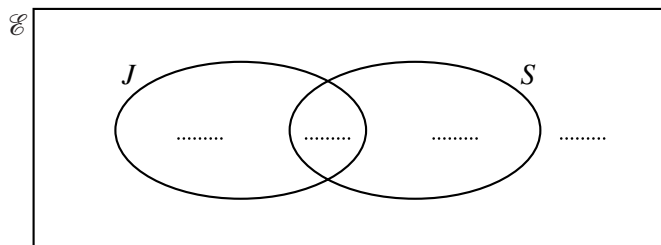
Electronic calculators should be used.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For π , use either your calculator value or 3.142.

This question paper consists of 8 printed pages.

- 1 (a) 12 friends take a holiday together in Jordan and Saudi Arabia.
 9 have already been to Jordan and 4 have already been to Saudi Arabia.
 The probability that one of the 12 friends, chosen at random, has already been to both countries is $\frac{1}{4}$.
- (i) Write down the number of friends who have already been to both countries. [1]
- (ii) Copy the Venn diagram below.



$J = \{\text{those who have already been to Jordan}\}$ and
 $S = \{\text{those who have already been to Saudi Arabia}\}.$

Write the number of friends in each part of your Venn diagram.

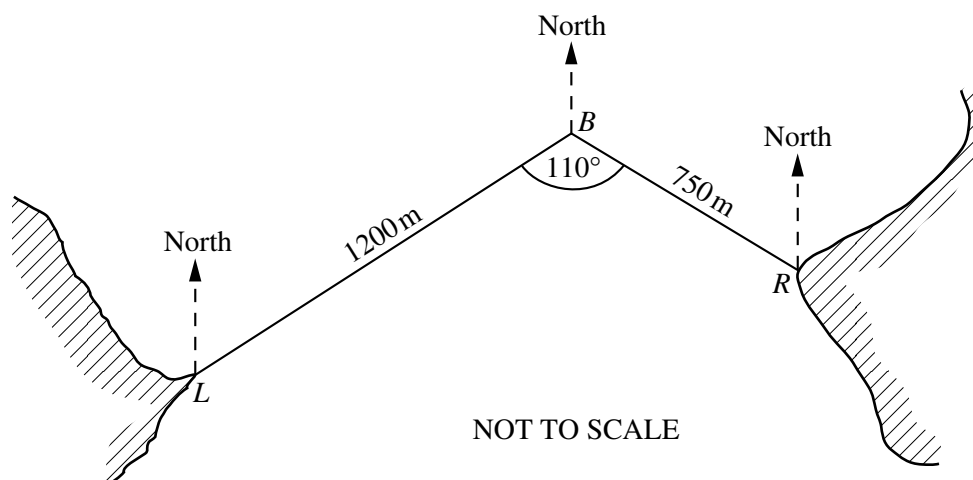
[4]

- (iii) Write down the value of $n(J \cup S)$.

[1]

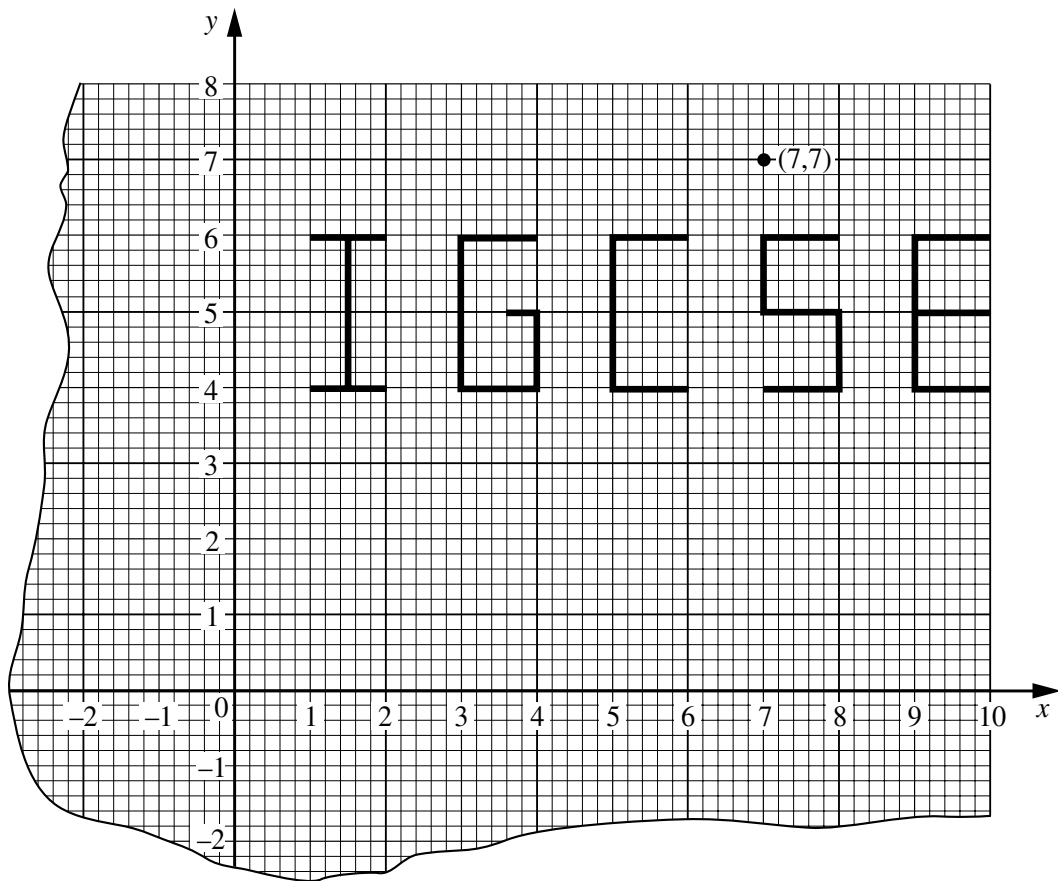
- (b) Ahmed changed 1000 Riyals into Dinars. The exchange rate was 1 Dinar = 5.28 Riyals.
 He then divided the Dinars between himself, Yousef and Ibrahim in the ratio 2 : 3 : 1.
 How many Dinars did Ahmed keep for himself? Give your answer to the nearest Dinar. [3]

2



A boat B is 1200 metres from a lighthouse L and 750 metres from a rock R . Angle $LBR = 110^\circ$.

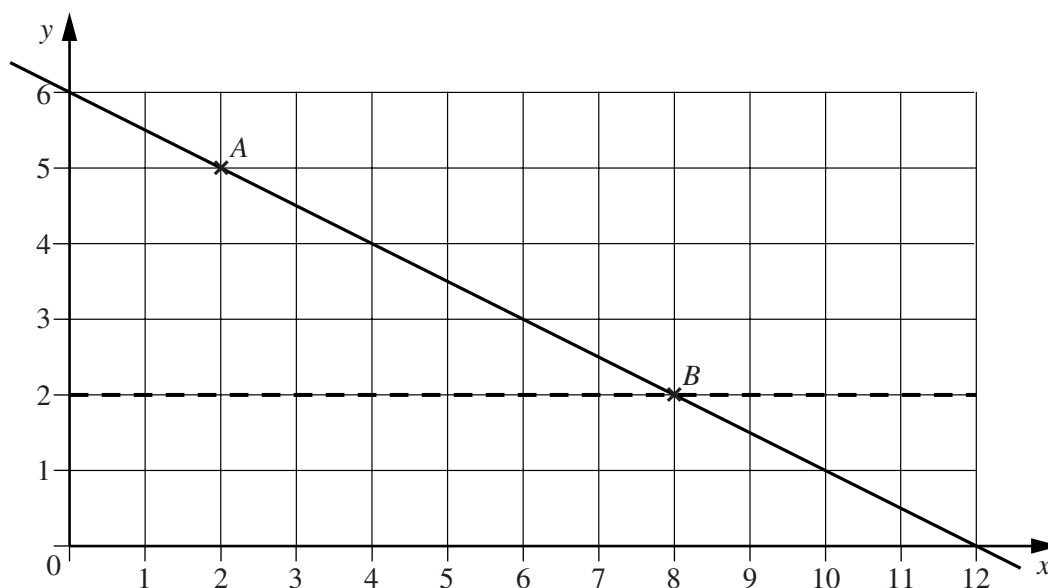
- (a) Calculate
- (i) the length LR , correct to the nearest metre, [4]
- (ii) angle BLR , correct to the nearest degree. [4]
- (b) The bearing of B from L is 053° .
 Calculate
- (i) the bearing of L from B , [2]
- (ii) the bearing of B from R . [2]
- (c) The boat is sailing due south.
 Calculate, to the nearest metre, its closest distance to the lighthouse. [3]



Answer the whole of this question on one sheet of graph paper.

- (a) Using a scale of 1 centimetre to represent 1 unit on each axis, draw an x -axis for $-6 \leq x \leq 10$ and a y -axis for $-6 \leq y \leq 8$.
Copy the letters IGCSE accurately from the diagram above onto the **same position** on your graph paper. Each letter is 2 cm high and 1 cm wide.
[For example, the letter I lies in the rectangle $1 \leq x \leq 2$ and $4 \leq y \leq 6$.] [2]
- (b) Draw accurately the image of your letters under the following transformations.
- (i) Rotate your letter I by 90° clockwise about the origin. [2]
 - (ii) Reflect your letter G in the y -axis. [2]
 - (iii) Enlarge your letter C, scale factor 4, centre (7, 7). [2]
 - (iv) Translate your letter S by the vector $\begin{pmatrix} -3 \\ -4 \end{pmatrix}$. [2]
 - (v) Stretch your letter E parallel to the y -axis, stretch factor 0.5, with the x -axis invariant. [2]
- (c) (i) Find the transformation matrix \mathbf{M} which represents rotation by 90° clockwise about the origin. [2]
- (ii) Find the inverse matrix \mathbf{M}^{-1} and describe in words the transformation which it represents. [3]

4



Answer this question without using graph paper.

A is the point $(2, 5)$ and B is the point $(8, 2)$.

- (a) Find the equation of the line AB . [2]
- (b) Calculate the length of the line AB , giving your answer correct to 2 decimal places. [2]
- (c) Find the coordinates of the point C such that A is the midpoint of BC . [2]
- (d) Point D lies on the line $y = 2$ and has coordinates $(x, 2)$.

Find two possible values of x if the area of triangle ABD is 15 cm^2 . [3]

5 Answer the whole of this question on a sheet of graph paper.

- (a) Using a scale of 1 centimetre to represent 1 unit on each axis, draw an x -axis for $-6 \leq x \leq 10$ and a y -axis for $-2 \leq y \leq 12$.

Mark the points $A(-6, 1)$, $B(-3, 10)$ and $C(9, 6)$.

Draw the triangle ABC . [2]

- (b) Construct the locus of points
 - (i) 7 cm from A and inside triangle ABC , [2]
 - (ii) equidistant from B and from C , [2]
 - (iii) equidistant from BC and from AC . [2]
- (c) Shade the region inside triangle ABC which is less than 7 cm from A and nearer to BC than to AC . Label this region R . [2]
- (d) Shade the region inside triangle ABC which is nearer to C than to B and nearer to BC than to AC . Label this region S . [2]

6 Monica received x marks in a test. Sandra received 4 marks more than Monica.

(a) Write down Sandra's mark in terms of x . [1]

(b) When Monica subtracts 7 from her mark and squares the result, her answer is 1 more than Sandra's mark.

(i) Write down an equation in x and show that it simplifies to

$$x^2 - 15x + 44 = 0. \quad [3]$$

(ii) Solve the equation $x^2 - 15x + 44 = 0$. [3]

(c) The test was marked out of 10. Write down the mark received by each girl. [1]

7

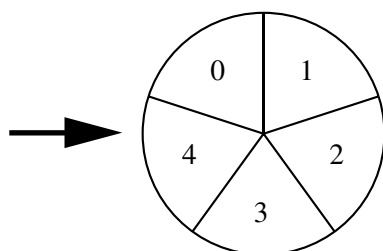


Diagram 1

		First number				
		0	1	2	3	4
Second number	0	•	•	•	•	•
	1	•	•	•	•	•
	2	•	•	•	•	•
	3	•	•	•	•	•
	4	•	•	•	•	•

Diagram 2

The wheel in Diagram 1 has one of the numbers 0 to 4 in each of its five identical sectors.

The wheel is spun and when it stops the arrow points to a number.

All numbers are equally likely.

Diagram 2 shows the possible outcomes when the wheel is spun twice.

(a) Find the probability that

(i) both numbers are 3, [1]

(ii) both numbers are the same, [2]

(iii) the sum of the two numbers is 6, [2]

(iv) the product of the two numbers is 8 or more, [2]

(v) the product of the two numbers is less than the sum. [2]

(b) $S = \{\text{all possible values of the sum of the two numbers}\}$.

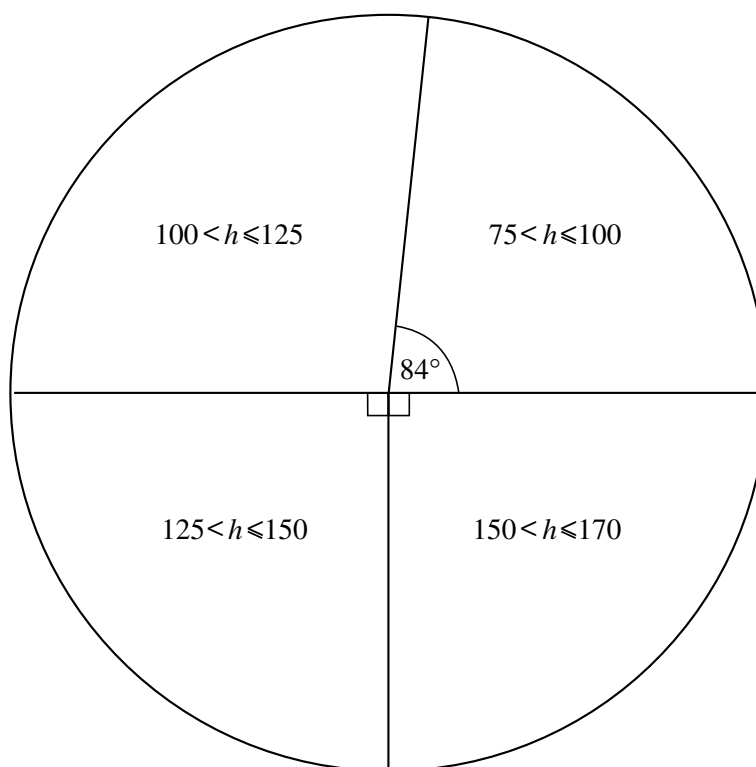
$P = \{\text{all possible values of the product of the two numbers}\}$.

(i) List the elements of S . [2]

(ii) List the elements of P . [2]

(iii) Find $S \cap P'$. [2]

8 (a)



The heights, h centimetres, of 60 children are shown in the pie chart above.

- (i) What is the angle in the $100 < h \leq 125$ sector? [1]
- (ii) How many children have a height less than or equal to 100 centimetres? [1]
- (iii) How many children have a height less than or equal to 150 centimetres? [1]
- (iv) Write down the width of each class interval.

Which of the four groups in the pie chart would give the highest bar in a histogram?

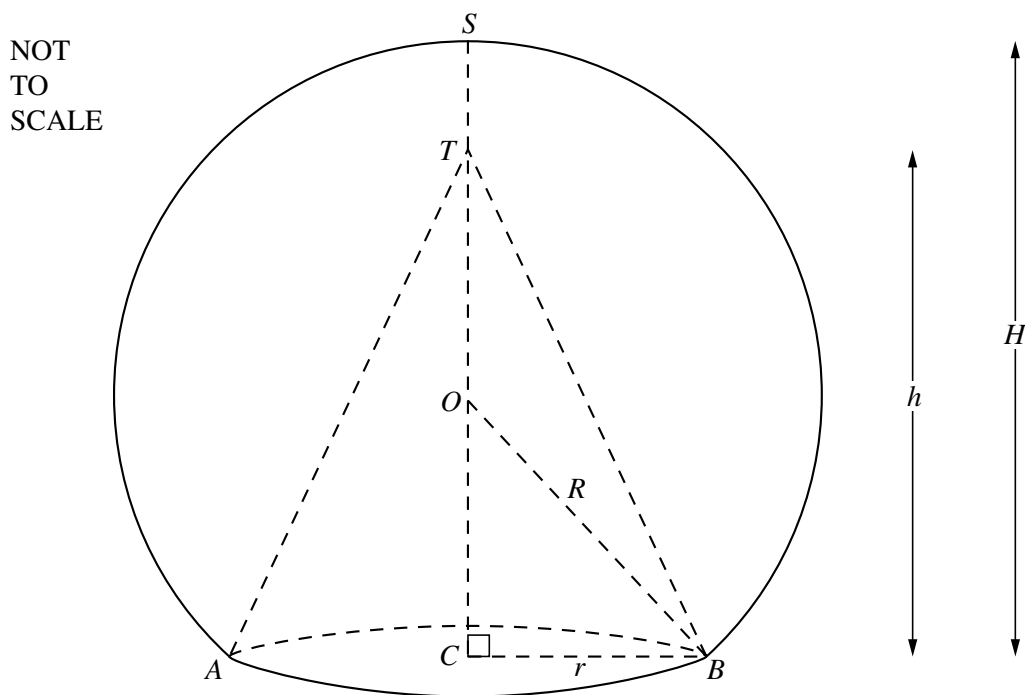
Explain your answer, but do **not** draw an accurate histogram. [3]

- (b) The 60 children are asked how many pets they have. The results are shown in the table below.

Number of pets	0	1	2	3	4	5	6
Frequency	16	14	3	9	7	6	5

Find

- (i) the mode, [1]
- (ii) the median, [2]
- (iii) the mean number of pets per child. [2]



A cone, ATB , and a section of a sphere, ASB , share the same circular base, centre C , radius r . The height, TC , of the cone is h and $STOC$ is a straight line. The radius, OB , of the sphere is R and the height, CS , of the section of the sphere is H .

(a) $r = 6$ cm, $h = 14$ cm and $R = 10$ cm.

(i) Calculate the volume of the cone ABT . [2]

[The volume of a cone with base radius r and height h is $\frac{1}{3}\pi r^2 h$.]

(ii) Show that the height, SC , of the section of the sphere is 18 cm. [2]

(iii) Calculate the volume of the section of the sphere ASB . [2]

[The volume of a section of a sphere, radius R , height H is $\frac{1}{3}\pi H^2(3R - H)$.]

(iv) Find the percentage of the volume in the section of the sphere **not** occupied by the cone. [2]

(b) In a different sphere section, $R = 3$ cm, $h = 2r$ cm and $TS = 1$ cm.

(i) Write down the height, SC , in terms of r and show that $OC = (2r - 2)$ cm. [2]

(ii) Use Pythagoras' theorem in triangle OCB to find OC^2 in terms of r . [1]

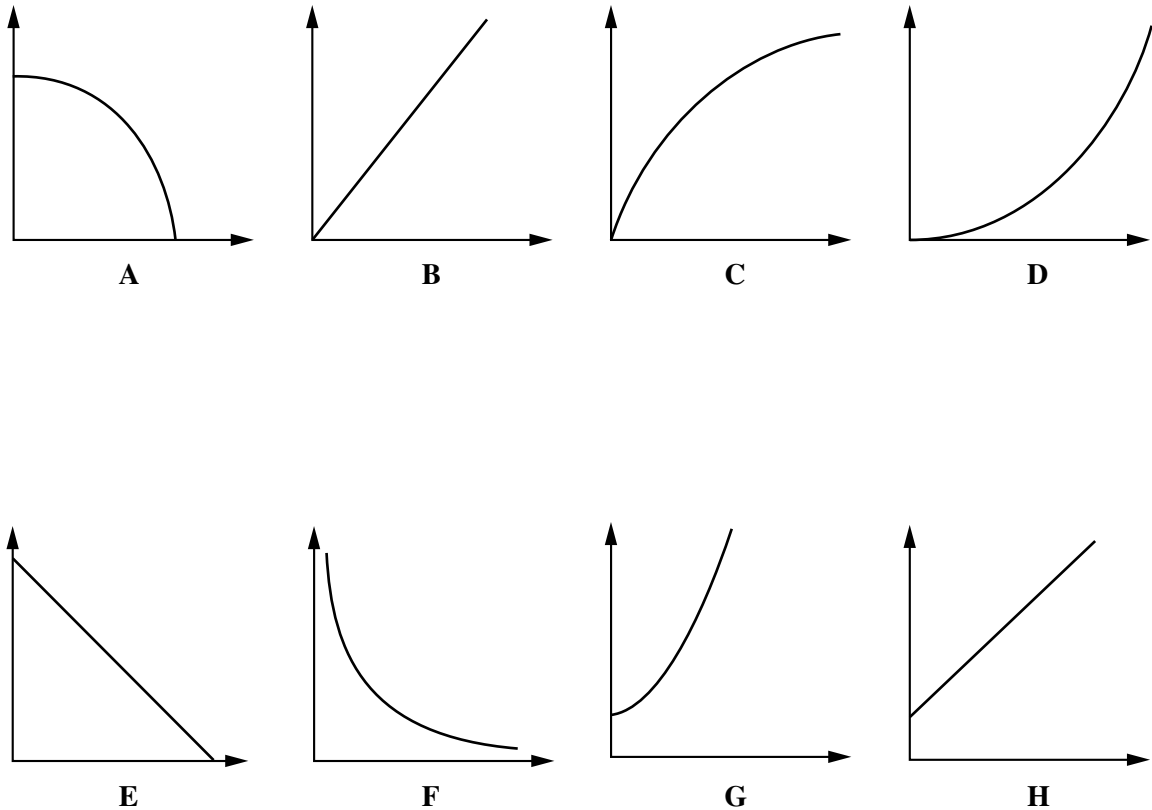
(iii) Use your answers to parts (b)(i) and (b)(ii) to show that $5r^2 - 8r - 5 = 0$. [3]

(iv) Solve the equation $5r^2 - 8r - 5 = 0$.

Show all your working, and give your answers correct to 2 decimal places. [5]

(v) Write down the height of the cone. [1]

10



(a) Write down which one of the sketch graphs above labelled **A** to **H** shows each of the following:

- (i) a **speed** – time graph for a car which starts from rest and has constant acceleration; [2]
- (ii) $y = x^3 + 1$; [2]
- (iii) y is inversely proportional to x^2 ; [2]
- (iv) the sum of x and y is constant; [2]
- (v) $y = \cos x$ for $0^\circ \leq x \leq 90^\circ$; [2]
- (vi) a **distance** – time graph when the speed is decreasing. [2]

(b) Write down an equation for sketch graph **D** if it passes through the points (1, 1) and (2, 4) and, when extended to the left, has line symmetry about the vertical axis. [2]